

Modified Enlarged 18pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

June 2025

GCSE (9–1) Physics A (Gateway Science)

J249 01/02/03/04

Equation Sheet

INSTRUCTIONS

Do NOT send this Equation Sheet for marking. Keep it in the centre or recycle it.



EQUATIONS IN PHYSICS

Key: HT = Higher Tier only

	P1 MATTER		
	density = $\frac{\text{mass}}{\text{volume}}$		$\rho = \frac{m}{V}$
	change in thermal energy = mass × specific heat capacity × change in temperature		$\Delta E = m c \Delta \theta$
	thermal energy for a change in state = mass × specific latent heat		$E = m l$
	for a given mass of gas at a constant temperature: pressure × volume = constant		$p V = \text{constant}$
HT	pressure due to a column of liquid = height of column × density of liquid × gravitational field strength		$p = h \rho g$

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	P2 FORCES		
	distance travelled = speed × time		$s = v t$
	acceleration = $\frac{\text{change in velocity}}{\text{time}}$		$a = \frac{v - u}{t}$
	$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$		$v^2 - u^2 = 2 a s$

	P2 FORCES		
	kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{speed})^2$		$E = \frac{1}{2} m v^2$
	force = mass $\times$ acceleration		$F = m a$
HT	momentum = mass $\times$ velocity		$p = m v$
	work done = force $\times$ distance (along the line of action of the force)		$W = F s$
	power = $\frac{\text{work done}}{\text{time}}$		$P = \frac{W}{t}$
	force exerted by a spring = spring constant $\times$ extension		$F = k x$
	energy transferred in stretching = $\frac{1}{2} \times$ spring constant $\times$ (extension) ²		$E = \frac{1}{2} k x^2$
	gravitational force = mass $\times$ gravitational field strength		$W = m g$
	gravitational potential energy = mass $\times$ gravitational field strength $\times$ height		$E = m g h$
	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$		$p = \frac{F}{A}$
	moment of a force = force $\times$ distance (normal to direction of the force)		$M = F d$

	P3 ELECTRICITY	
	charge flow = current × time	$Q = It$
	potential difference = current × resistance	$V = IR$
	energy transferred = charge × potential difference	$E = QV$
	power = potential difference × current	$P = VI$
	power = (current) ² × resistance	$P = I^2 R$
	energy transferred = power × time	$E = Pt$

	P4 MAGNETISM AND MAGNETIC FIELDS	
HT	force on a conductor (at right angles to a magnetic field) carrying a current: force = magnetic flux density × current × length	$F = BIl$
HT	$\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$

	P5 WAVES IN MATTER	
	wave speed = frequency × wavelength	$v = f\lambda$

	P7 ENERGY		
	efficiency = $\frac{\text{useful output energy transfer}}{\text{input energy transfer}}$		
	P8 GLOBAL CHALLENGES		
	potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil		$V_p I_p = V_s I_s$

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